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10/726,521	12/04/2003	Young-Ho Lee	1349.1298	7200

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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/726,521	LEE, YOUNG-HO	
	Examiner	Art Unit	
	DAVID N. WERNER	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-8 and 10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-8 and 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action for US Patent Application 10/726,521 is in response to communications filed 19 February 2008, in reply to the Non-Final Rejection of 20 November 2007. Currently, claims 1, 3-8, and 10 are pending.

2. In the previous Office action, claims 1, 5, 8, and 10 were rejected under 35 U.S.C. 103(a) as obvious over "Efficient Block Motion Estimation Using Integral Projection" (Sauer et al.) in view of US Patent 6,285,711 B1 (Ratakonda et al.). Claims 3, 4, 6, and 7 were rejected under 35 U.S.C. 103(a) as obvious over Sauer et al. in view of Ratakonda et al. and in further view of US patent 6,128,047 (Chang et al.).

Response to Arguments

3. Applicant's arguments filed 19 February 2008 have been fully considered but they are not persuasive. Applicant argues, first, that since that the improved quasi-projection method of Ratakonda et al. teaches away from the basic integral projection method of Sauer et al., a person of ordinary skill would be led away from Applicant's method of integral projection (pg. 6), second, that Sauer et al. discloses horizontal and vertical projection on blocks of K x K pixels in a current frame and a search area of K+2S x K+2S pixels in a previous frame whereas the present invention claims calculating motion vectors of a "second frame with reference to the first frame", third, that Sauer et al. discloses a normalized Mean Absolute Error (MAE) calculation whereas the present invention claims a Sum of Absolute Difference (SAD) calculation,

fourth, that Ratakonda does not teach the claimed SAD calculation, fifth, that Chang et al. does not teach the claimed step of "selecting the least absolute value of the absolute values" of claims 3 and 6, and sixth, that the N x N candidate block of Chang et al. is incompatible with the claimed "region" having width M and height N.

Regarding Applicant's first argument, it is respectfully submitted that the use of a known technique to improve a device comparable or similar to a base device has been held to involve only routine skill in the art. See MPEP 2143(C), *KSR International Co. v. Teleflex Inc.*, 550 U.S. ____, ____, 82 USPQ2d 1385, 1396 (SCOTUS 2007), *In re Nilssen*, 85 F.2d 1401, 7 USPQ 2d 1500 (Fed. Cir. 1988), and *Ruiz v. AB Chance Co.*, 357 F.3d 1270, 69 USPQ2d 1686 (Fed. Cir. 2004). In the present case, Sauer et al. discloses a "base" method of motion estimation using integral projections. Ratakonda et al. discloses an improved projection method that Applicant admits would "provide better results" than the conventional projection. Since the present invention claims a method of calculating a first motion component, displacing a search according to the motion component, and calculating a second motion component with respect to the displacement, **the present invention is a "quasi" projection method as described by Ratakonda et al**, which was a known improvement of the integral projection of Sauer et al. Therefore, it is respectfully submitted that the combination of Sauer et al. with Ratakonda et al. is proper.

Regarding applicant's second argument, Sauer et al. states that "In the previous frame, a candidate area of size (K + 2s) x (K + 2s), centered at the same spatial coordinates, is also transformed into its vertical and horizontal integral projections

(§II.A). It is respectfully submitted that while the claims in the present invention disclose calculating motion vectors and reference positions "of the second frame" with respect to the first frame, the claims never state where in the frame these calculations are made, much less limit the search area to an entire frame. Although the specification of the current application discloses performing motion vector calculation over a whole frame (paragraph 0039), applicant is reminded that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims, and the claims are to be interpreted as broadly as reasonable. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding applicant's third argument, it is respectfully submitted that a mean absolute difference including a normalization step, as described in Sauer et al., is merely an obvious variation of the sum of absolute differences, as claimed in the present invention, since the mean absolute difference is the but the sum of absolute differences with an additional scaling factor. See, for example, Vassiliadis et al., "The Sum-Absolute-Difference Motion Estimation Accelerator".

Regarding applicant's fourth argument, it is respectfully submitted that Ratakonda et al. was not relied on to disclose the claimed Sum of Absolute Difference calculation. Applicant is reminded that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Regarding applicant's fifth argument, it is respectfully submitted that Chang et al. was not relied on for teaching "least absolute values", but rather, Sauer et al. describes choosing vertical and horizontal displacements $\hat{a}$ and $\hat{b}$ as the results of minimum of absolute difference functions (§II.A). As stated in the previous Office action, "Sauer et al. discloses a MAE criterion in which the least of the sum of absolute differences of candidate vectors is chosen as a motion vector component" (pg. 7). Applicant is again reminded that nonobviousness over a combination of references may not be found from an alleged deficiency in one of the references alone. Clarification was also made to the discussion of claims 3 and 6 in view of Chang et al. to demonstrate that every claimed component of an SAD value calculator is disclosed in Chang et al.

Regarding applicant's sixth argument, it appears that Applicant contends that width M and height N should be interpreted as the width and height respectively, in pixels, of an entire frame. However, the claim merely describes M and N as "a width region and a height region". The use of the indefinite article "a" rather than the definite article "the" prevents the exclusive definition of the terms, as "a width region" and "a height region" may be a subset of the width and height of the complete image. Then, there is nothing in the claim that prevents the vertical range (0, N-1) as having the same dimension as the horizontal range (-sr, sr). See *Baldwin Graphic Systems Inc. v. Siebert Inc.*, 512 F.3d 1338, 85 USPQ2d 1503 (Fed. Cir. 2008). It is suggested that the phrase "a width region and a height region" be replaced with the phrase "the width and the height".

Therefore, in view of the above claim analysis, all rejections of the pending claims in view of the prior art are respectfully maintained.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 5, 8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Efficient Block Motion Estimation Using Integral Projection" (Sauer et al.) in view of US Patent 6,285,711 B1 (Ratakonda et al.). Sauer et al. teaches a motion estimation method. Regarding claims 1 and 8, Sauer et al. calculates an “estimated vertical and horizontal displacement” between a previous frame and a current frame (§ II.A). This corresponds with the claimed “vertical motion vector calculation” and “horizontal motion vector calculation”. In Sauer et al., a vertical projection vector is formed, with each entry formed from summing the pixels in a row in a search area (Equation 1). This corresponds with the claimed “adding values of pixels of each of horizontal lines forming the first frame to calculate vertical sums”. Each entry $p_v(m;i)$ in the vertical projection vector is individually used in further calculations (Equation 2). This corresponds with the claimed “storing the vertical sums by horizontal line”. A similar process is performed for a horizontal projection vector (§ II.A). This corresponds with the claimed “calculating differences between the vertical sums of the

first frame and vertical sums of the second frame". The vertical and horizontal projection vectors are then used in a Mean Absolute Error calculation to find motion vector $(\hat{a},\hat{b})$ (equation 2), with the displacement coordinates with the least difference between the current frame and previous frame chosen as the components for the motion vector. This corresponds with the claimed "processing the differences into absolute values to calculate sums of absolute value differences".

However, as argued by the Applicant, Sauer et al. does not teach determining a vertical offset determined from vertical motion vectors for use in horizontal motion calculation.

Ratakonda et al. teaches a modified, or "quasi", integral projection system. Rather than obtaining both the horizontal and vertical components of a motion vector using one search area, as in Sauer et al., in Ratakonda et al., a first motion vector component is estimated, then the search area is displaced according to the first motion vector component (column 6: lines 18-23). In the example shown in figure 2, the vertical motion is first estimated from row average vectors, and the search area is vertically displaced according to this vertical motion (column 6: lines 24-33). This corresponds with the claimed "shifting the second frame according to the vertical motion vector". The horizontal motion is then estimated from column average vectors according to the displaced search area determined from the estimated vertical motion (column 6: lines 33-37). This corresponds with the claimed "calculating horizontal motion vectors" according to the "decided vertical reference positions".

Sauer et al. discloses the claimed invention except for determining a horizontal motion vector according to a shifted position determined by a vertical motion vector. Ratakonda et al. teaches that it was known to shift the search area for horizontal motion vectors according to vertical motion. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made, to incorporate the vertical displacement of Ratakonda et al. into the integral projection of Sauer et al., since as admitted by the Applicant, Ratakonda et al. states in column 6: lines 14-16 that such a modification produces greater accuracy than conventional integral projection.

Regarding claims 5 and 10, in Sauer et al, the horizontal projection vector is used in a similar manner to the vertical projection vector described above to determine the horizontal component of motion vector $(\hat{a},\hat{b})$ (§ II.A), and in Ratakonda et al., the horizontal motion is determined from displacement according to vertical motion (column 6: lines 31-37).

3. Claims 3, 4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sauer et al. in view or Ratakonda as applied to claim 1 above, and further in view of US Patent 6,128,047 (Chang et al.). Sauer et al. discloses a MAE criterion in which the least of the sum of absolute differences of candidate values is chosen as a motion vector component (§II.A), but it does not disclose an adder component or selection component for performing this calculation.

Chang et al. discloses a system for determining motion vectors between two video frames with integral projection. Regarding claims 3 and 6, figure 12 shows a

processor in an embodiment of Chang et al. This processor contains processor element array 1220, which comprises an array of processor elements 1225, which include subtraction and adder units for SAD calculation (column 14: lines 6-13), which corresponds with the claimed “adder”, and accumulator 1230, which performs a comparison of SAD processor elements 1225 (column 14: lines 15-16) and so corresponds with the claimed “motion vector selector unit”.

Regarding claim 4, searching for the x-coordinate of a motion vector is performed from vertical projections (column 10: lines 34-37). The current block is compared to a series of candidate blocks to find the best match. If the difference between a candidate block is less than that for all previously searched candidate blocks, the current candidate block is considered the "best" block (column 10: lines 17-20). This difference is calculated according to the Sum of the Absolute Differences between the vertical projection of the current block and the vertical projection of the candidate block, over the search range (column 10: lines 39-50).

Regarding claim 7, similarly, the best-match block in the vertical direction is calculated according to the minimized Sum of Absolute Differences between the horizontal projection of the current block and the candidate block (column 11: line 41– column 12: line 34).

Sauer et al., in combination with Ratakonda et al., discloses the claimed invention except for details of SAD calculation. Chang et al. teaches that it was known to determine the best-match block to a current block between frames by minimizing SAD values, determined with adder units, according to integral projection. Therefore, it

would have been obvious to one having ordinary skill in the art at the time the invention was made to search for matching blocks from minimized SAD values from integral projection as taught by Chang et al., since Chang et al. states in column 2: line 49 that such a technique is faster and uses less computations than traditional "full-search" block matching.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner, whose telephone number is (571)272-9662. The examiner can normally be reached on MWF from 9:00-6:30, TR from 9:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri, can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. N. W./
Examiner, Art Unit 2621

/Mehrdad Dastouri/
Supervisory Patent Examiner, Art Unit 2621